Guidance for
Engendering Ecosystem Services
for Urban Transformation

Sarah Bradshaw and Brian Linneker with Nilo Nascimento, Indira Nahomi Viana Caballero, Heloisa Costa, Yumi Oki, Rogério Brittes W. Pires, Meri Juntti, Lian Lundy, Ken Scott-Brown, Rebecca Wade

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1. Introduction

Growing urbanisation and climate change present a number of important challenges to ensuring more sustainable development in the future. All human activities impact on the natural environment, especially cities. How urban development is undertaken and managed has implications for present and future wellbeing. This guidance focusses on how natural capital and its associated ecosystem services (ES) can be understood within the context of the urban environment. It focuses on how different ES can be incorporated into sustainable urban development and planning, as a natural asset that can reduce peoples risk and vulnerability, and improve their wellbeing.

This summary guidance aims to highlight how natural capital based ES can be seen as an 'asset' which can improve the well-being of communities, and the women and men, girls and boys that live within them.

It draws on existing findings about how environmental assets such as parks, street trees, water features and private gardens can contribute to human well-being, applied to the Brazilian context through an exploratory study centred in Nova Contagem, a peripheral suburb of Belo Horizonte.

It uses experience of undertaking the study to provide practical guidance in how to:
- Undertake an assessment of the environmental assets present in a community
- Evaluate the potential for urban environmental assets to yield ecosystem services - services such as Regulating (cooling shade), Provisioning (food and fuel), and Cultural (space for gathering / taking exercise) - and the nature of the goods, benefits, and at times dis-benefits, natural capital assets deliver

The findings of the study provide guidance around:
- How people understand what the environment is, and how they value, or not, different types of urban environmental assets
- The ecosystem services and dis-services they derive from the natural environment
- How environmental assets interact with other assets to improve well being

The premise of the study is that access to urban environmental assets and the ecosystem services they provide, is not equal for all within a community or a

household, and in particular women and men will have different access to these and other assets. The study then also provides insights into:

- Differences in women and men's understandings of the environment and its potential for improving well being
- Differences in women and men's access to environmental assets and the ecosystem services they may provide
- Actions that could be taken to improve gender equality of access to ecosystem services

Ultimately the guide seeks to provide recommendations on what local authorities and community organisations can do to ensure that the existing environmental assets are valued and protected and the beneficial services are maximised and made accessible to all, while the dis-services are minimised.

2. Frameworks and Key Terminology

Over recent years more attention has been paid to the relationship between the planet and people. On the one hand the threats raised by rapid urbanisation and climate change to livelihoods and wellbeing has led to a renewed interest in how to protect the natural environment, and to adapt to change. On the other hand, there has been recognition that the natural environment can be an asset in the fight against poverty and to improve people's wellbeing.

There is a large literature on wellbeing and what this might mean. In environmental justice literature wellbeing is used to refer to the ability of individuals to fulfil their needs or even more broadly, the ability of individuals to lead the kind of lives in which they find meaning and happiness. But this raises questions about the meaning of happiness and highlights how wellbeing is a highly subjective notion. This project views environmental assets as having the potential for improving people's wellbeing. This could be through lessening risks of events that cause harm, such as landslides and floods, or through being able to exercise in a local park or able to enjoy seeing flowering plants there. This is not to say people should exercise, but that people understand the potential benefits and have the potential to enjoy these benefits if they wish to. It is then about people being able to make informed choice to improve their own lives.

Within the discussion of poverty and wellbeing a number of frameworks have been developed that seek to incorporate the environment as an asset. In the environmental literature there have also been attempts to provide frames that allow a better understanding of how nature interacts with other social processes and the idea of 'ecosystem services' is one such framing. However, the discussions often occur in parallel, among different groups of people, and while each recognises the other, the links are not well developed. In this project, what we have tried to do is integrate two frameworks – one developmental and one environmental – and also to include a 'gender' perspective – that is to make sure that any differences between men and women are recognised within these framings. The different frameworks are presented below.
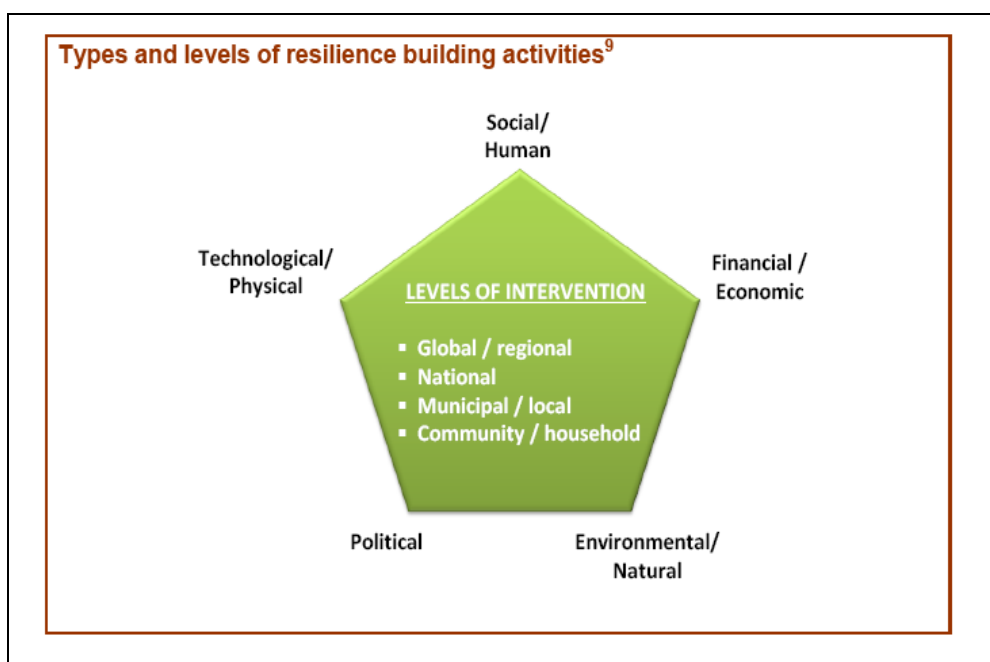
2.1 Assets and capitals

The terms assets and 'capitals' are often used interchangeably or sometimes the term 'capital assets' is used. While initially referring to income flows produced from financial capital, other capitals have been recognised - such as human capital,

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arising from investment in education or health, and social capital, arising from investing time in building up assets such as networks and friendships on which you can draw when things are difficult. The idea then is that stocks of capital can be changed through investment. Investment and disinvestment can change the size of capital assets and affects the flow of benefits over time. Understanding nature as a 'capital' comprising of 'assets' recognises that the environment can provide opportunities for investment that will yield benefits in the future, for example through planting a tree to harvest fruit. However, natural capital is often a public good, such as the atmosphere or biodiversity, which yields more intangible benefits such as oxygenating the planet.

Clearly different people will have access to a mix of different stocks of capital assets, and varying combinations of assets will produce differing levels of wellbeing. The UK Department for International Development (DFID) have used the idea of an 'assets pentagon' to express this, with the length of each 'side' of the pentagon varying according to the stocks of that capital an individual has.

Figure 1 - DFID's Capital Asset Pentagon

Types and levels of resilience building activities[9]

Social/ Human

Technological/ Physical

Financial / Economic

LEVELS OF INTERVENTION

- Global / regional
- National
- Municipal / local
- Community / household

Political

Environmental/ Natural

Source: UK Department for International Development DFID

While natural/environmental assets are included in this and other asset frameworks, often rather than focus on the services derived from natural assets, instead the poverty alleviation discourse tends to construct nature as risk. A DFID fact sheet for example notes "Many of the shocks that devastate the livelihoods of the poor are

themselves natural processes that destroy natural capital (e.g. fires that destroy forests, floods and earthquakes that destroy agricultural land)". Nature then, and particularly in the climate change discourse, is often constructed as producing vulnerabilities as opposed to an environmental perspective which perceives nature as the source of multiple benefits (e.g. food, fuel, clean air and water) on which we all depend.

Assets are useful in helping understand how people cope with poverty and reduce vulnerability and some models focus more on the transformative nature of assets. 'Transformation' in social science literature refers to changes in relations of power and access to resources that improve the ability of individuals (or households / communities) to independently make choices that contribute to wellbeing and/or experienced quality of life. Positive transformations are therefore portrayed as the most sustainable form of poverty alleviation. This kind of transformative capacity depends on access to and ability to engage with a range of social, economic, physical and natural assets, but is also mediated by institutional factors and processes and individual perceptions and social norms such as those conditioning men's and women's roles and activities.

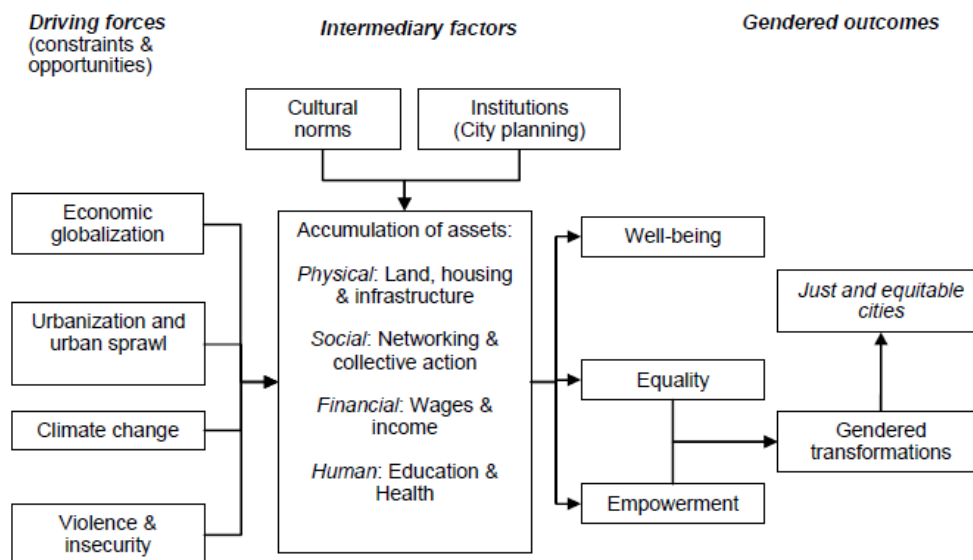Figure 2 - Moser's Capital Assets Framework

Figure 1: Gender asset accumulation pathways to empowerment and transformation

Source: Moser, C.O (2014) Gender, Asset Building and Just Cities. Briefing Paper WUF7 Networking Event http://hummedia.manchester.ac.uk/schools/seed/gurc/working_papers/briefingpapers/GURC_BP6.pdf

Moser's Capital Asset Framework (Figure 2) focuses on assets for urban transformation, and is another useful framework through which to understand the role of assets in improving wellbeing – here not just looking at wellbeing of individuals, but also the role of assets in wider societal processes such as constructing more just cities and improving gender equality.

While the environment is recognised in asset frameworks for poverty alleviation it is often the least developed of all the asset categories. Similarly, recent poverty measures that have moved away from only focussing on income to include multidimensional indicators of wellbeing incorporate a range of assets. While these measures could include environmental assets, they generally do not, and if they do include the environment it is as a 'risk' to wellbeing rather than an asset to improve wellbeing. This guidance focusses on how the urban environment can be understood and sustainably managed as an asset that reduces risk and vulnerability.

Outside of the poverty discourse advancements have been made in better understandings the potential goods and services that can be gained from the environment, and these has been termed 'Ecosystem Services' (ES).

2.2 Ecosystem services

The Millennium Ecosystem Assessment (MEA) suggests the notion of ES encapsulates the dynamic processes through which natural capital when mobilised, provides a range of services, goods and benefits that are critical to sustaining life e.g. oxygen, food, water and recreational and psychological benefits. Ecosystem Services frameworks allow us to conceptualise environmental functions as an explicit link between natural capital and human wellbeing.

The MEA considers the benefits provided by nature to people, and our current impact on the ability of nature to continue to deliver these benefits, through an ecosystem services (ES) framework. The MEA identifies four key categories of ES as follows:
- Supporting services e.g. nutrient cycling, oxygen production and soil formation
- Provisioning services e.g. fuel, food, water
- Regulating services e.g. climate regulation, water purification and flood protection
- Cultural services e.g. education, recreation and aesthetic value

These services can be derived from different land covers such as green spaces (the countryside, public parks and private gardens) or from blue spaces (such as lakes and streams). There are also grey/green spaces and this term is here used to suggest a more urbanised or 'built environment' such as a public square which has little vegetation but could still potentially provide some ES.

Early ES models often assumed the existence of natural resources means the ecosystem services they deliver exist by default, but more recent models have refined this view (see Figure 3). They recognise that 'service providing units' such as a tree or forest, can generate 'ecosystem service potentials' such as producing harvestable products, but unless the benefits of this service (e.g. a fruit) are 'mobilised', in this case actually accessed and consumed, then the tree is not delivering an ecosystem service to individuals or groups of individuals. As mobilising ES potentials involves issues of access and control, then clearly not all people will have equality of access to, and control over, ES within communities, or indeed within households. Mobilisation' of ES also requires motivation – the willingness to undertake exercise or gardening activities for example, and subjective perceptions of identity, capability and knowledge, all of which are gendered also play a role in ES mobilisation. Different people will have different motives and capacities for 'appropriation' of and thus different capabilities to benefit from existing natural capital or 'biophysical structures'. However, there may be ES dis-benefits also, for example, when leaves fall from a tree they can block drains or become slippery when wet or instead of recreational opportunity, a nearby park can be perceived as providing opportunity for antisocial behaviour and crime. The last stage in most ecosystem service models is often the most controversial – commercialisation of the service generated. While harvesting fruit to sell at market clearly generates exchange value some are wary at attempts to put a price on natural assets more generally, and on the more intangible benefits they may bring. They are concerned that putting a market value on a local green space, for example, may lead to charging for access to it, or may be used to justify its sale for urban development.

While ES then can help advance how we understand the natural environment as an asset or capital, there is clearly a lot to take into consideration about how it is mobilised particularly in an urban development context. However, while the natural environment provides the potential to bring benefits to all people, to date little

attention has been given to who can or cannot access ES, and why, including lack of consideration of gendered experiences of ES.

Figure 3 - Linking the flow of ecosystem services from nature to experienced environmental quality
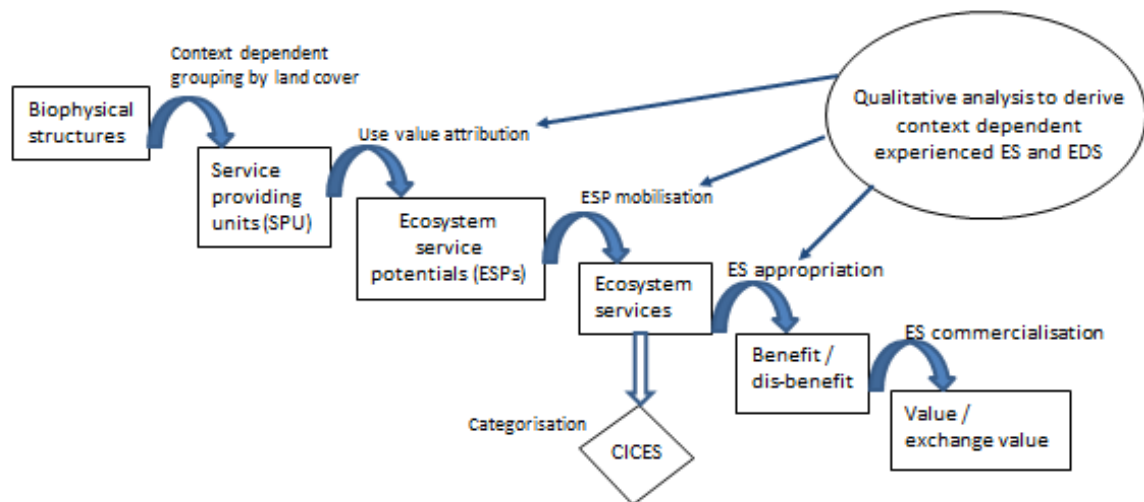
Source: Juntti and Lundy, adapted from Spangenberg et al. (2014) 'The ecosystem service cascade' Ecological Economics, 104, 22- 32

2.3 Gender differences

Since the 1990s there has been recognition that poverty has a 'female face'. Women are assumed to be poorer than men for a number of reasons, that can be summarised as the fact that women are less able to change work into income, income into decision making, and less likely to make decisions to improve their own wellbeing rather than the wellbeing of others.

Lack of income, combined with social norms that give women less voice in the home mean that they have less access to, and control over, household resources and over the life course, men may accumulate more assets than women, and the assets accumulated may differ between men and women, and be used differently. However, while research exists on gendered differences in financial, human, social and political capitals, and increasingly around technological capital, there is less known about gendered differences in access to and control over environmental assets, and how these interact with other assets and capitals to promote well-being. This project addresses this gap in knowledge.

In general, those who write about gender and the environment have tended to present women as closer to nature, and in part this rests on the fact women give birth

and are 'naturally' more attuned to the environment - the idea of 'mother nature'. As they are also seen to be 'naturally' more caring, so they are assumed to care for the environment more than men. Others agree that women may better understand nature but not because of their sex, but because they are the ones who have less access to modern practice and rely on the more marginal lands and thus their closeness to nature is as much due to economic as biological or social factors. Whatever the case, the idea of women being closer to nature is a persistent one, but this may not translate into women being able to access, and more importantly make decisions over, natural 'assets' such as land and its resources.

As Moser's framework suggests, accessing and controlling assets can transform both individual lives and urban spaces. However, Moser's framework raises a series of questions around how this can be achieved, and around how to ensure wellbeing improvements benefit both women and men. Further, and particularly relevant to this Guidance Note, this framework has yet to integrate the role of environmental assets in bringing positive social change.

2.4 How might ES link with other assets?
Linking the capital assets framework with the ecosystem services associated with natural capital shows multiple intersections.

Figure 4 Overview of key cross-linkages between Moser's capital assets framework and the ES framework
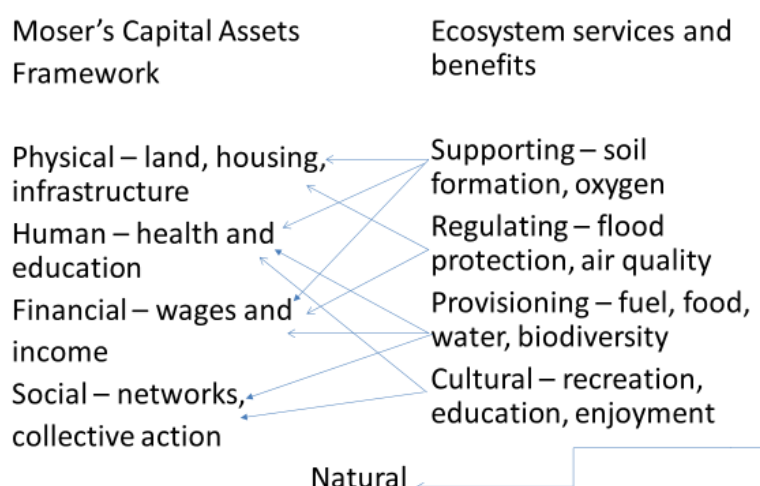
Source: Bradshaw (2016) presentation at: Engendering Habitat III: Facing the Global Challenges in Cities, Climate Change and Transport, Madrid, 5th-6th October 2016

Supporting Services such as soil formation contribute to the generation of Physical Assets such as land for agriculture, which in turn potentially interacts with Financial Assets if the land is cultivated. Regulating Services, such as improving air quality, impact on Human Capital through influencing health, but may have negative impacts on Physical Assets such as land and housing if their degradation leads to flooding or contributes to drought, for example, and of course this will also have an impact on income and Financial Assets. The impacts of Provisioning Services are perhaps the most obvious as nature provides resources such as food, water, and fuel stuffs necessary for day-to-day living and have an impact on Financial Assets. They bring related health benefits for Human Capital also, and if shared with family or friends help foster Social Capital. Social Capital can also be an outcome of the Cultural Services provided by nature, through collective recreational activities such as walking in the countryside, while the simple enjoyment of seeing a flower in bloom, for example, can improve mental wellbeing and thus Human Capital.

It is clear then that combining the MEA Ecosystem services and Moser's Asset frameworks may lead to new understandings of how different assets interact to improve wellbeing and new insights into the role of the environment in determining wellbeing. Applying a gender lens will allow better understanding also of any differences between women and men in accessing and utilising assets, particularly environmental assets. It will help answer the question of how we can ensure equality of access to natural assets that improve human wellbeing, while still protecting these assets, and the wider question of how to ensure sustainable and equitable urban growth.

3. Establishing the potential ES in the area

This guidance looks at how to better understand how environmental assets interact with other assets to improve women and men's well-being, reduce poverty and vulnerability, and thus promote more resilient and gender just urban spaces.

This Guidance draws on the findings of research project – ADEPT. The project involved two UK universities - Middlesex University in London and Abertay University in Dundee - and the Universidade Federal de Minas Gerais in Brazil, It was funded by a RC-UK Newton partnership award in conjunction with FAPEMIG. It involved fieldwork centered around Nova Contagem, Belo Horizonte. It included Nova Contagem – a peripheral urbanisation which sits close to a large prison and some industrial activity but also close to open countryside and the Vargem das Flores reservoir - and two neighbouring communities – Tupã and Solar do Madeira. These are small but growing communities on the shores of the reservoir in a preservation area, so are less urbanised and have greater ease of access to the countryside and reservoir.

The fieldwork methods included:
- A scientific environmental assessment of the potential ES in the catchment
- Qualitative interviews (37) around the natural environment and how it is accessed and understood by those living in Nova Contagem, Tupã and Solar do Madeira
- Narrative walks (9) using a phone application to record thoughts on, and images of, the natural environment in which the interviewed participants live
- A survey questionnaire (400) developing indicators of asset stocks, and exploring understandings of assets, how they interact with each other for those living, working, or frequently visiting Nova Contagem

This Guidance will focus not on the findings themselves, as much as how the findings were generated and what they mean for those seeking to ensure that existing environmental assets are valued and protected and the beneficial services are maximised and made accessible to all, while the dis-services are minimised. It begins by using the study's findings to highlight why a focus on the environment might be important for feelings of wellbeing in peripheral communities such as those studied.

4. Why should we focus on the natural environment and the ES it may provide?

- The study demonstrates the links between social capital, human capital, physical capital, financial capital, and importantly that, natural capital impacts on them all.

The study demonstrates that Higher Social Capital such as being able to ask neighbours for help, or borrow money, was related to higher Human Capital such as being in good health. In turn being in good health was related to higher levels of education, and education too was related to stocks of Social Capital – with those with lower levels of education less likely to report having friends, and more likely to report conflictive relations with neighbours. Education was also related to Financial Capital in that those with higher education are less likely to be poor.

Financial Capital, or lack of, was to some extent made up for by mobilising Natural Capital and Provisioning Services such as fishing, collecting fruit, hunting birds and small animals, and were part of coping strategies for low income males in particular. Natural Capital was also related to Human Capital and those with higher education showed a greater appreciation of the countryside and had more 'green' attitudes.

Health too is linked to Natural Capital as respondents valued trees for improving air quality and helping with physical ailments and, given the countryside is associated by those in the study with peace and quiet, stress release - providing an escape from the perceived violence of urban life and bringing improved mental health. The fact caring for public plants and trees could improve community relations – Social Capital – was also recognised and local squares and parks helped to build a sense of place or belonging.

→ The study reveals that it is the poor that have less access to non-urban public green space such as the countryside, and less access to private green spaces and, therefore, the benefits plants and trees can bring for wellbeing.

- The study shows that green spaces – especially the countryside – are sights of intersecting inequalities.

The poor are more likely to say they would be upset if green spaces were reduced but less likely to visit/walk in the countryside so they see green as 'urban green' spaces – parks and squares then are important to the poor.

Those that have lower incomes are more likely to mention trees as important for air quality but less likely to have access to trees, and the overcrowded conditions in which they live mean they have less access to the provisioning, cooling and regulating services trees bring.

There is no equality of access to the countryside and to public blue spaces such as the reservoir even when access is 'free' and open to all, as other factors such as time and money may limit ability to take up these opportunities if a bus journey is required. While the poor who live near these public green and blue spaces utilise them for provisioning services to supplement incomes, it is the richer and more educated local people who tend to use them for purely recreational purposes. Those that visit from outside the area for recreation may upset the provisioning abilities of those that live near there – the rich visitors bringing jet skis that disturb those fishing, for example. Women too are a group that have little engagement with the countryside and here it seems to be a feeling of insecurity that limits access. Feeling afraid to walk alone around their neighbourhood even during the day, emerged from the survey as the key factor limiting access to all public green spaces – including urban green space. → It is women who access green spaces least, and the countryside is a masculinised space for provisioning services, while recreational use is related to higher incomes and higher education.

- People value plants and trees and understand their value for reducing risks from natural hazards, such as floods and landslide.

People like to cultivate plants and trees in their back yards and there is no difference by sex or income – it is space that determines if they can plant in their own homes. While there is evidence that people seek to preserve existing trees, an asset trade-off is apparent given if they need the space to build an extra room (physical capital) often driven by a relative not being able to afford to set up home alone (financial capital) then the cost is reduction in outdoor space, plants and trees (natural capital). People first and foremost recognise the provisioning services to be gained from environmental assets such as access to food and fuel, some people fish not just for recreation but to eat the fish, and some even sell the fish adding a financial aspect. Many people want more 'public' trees on pavements and in parks to provide shade, and want more plants in public places for the beauty they bring. Trees are also recognised as regulating air quality, and to some level their role in ensuring rainwater absorption is also recognised. The latter is more apparent when it ceases to function, and the lack of trees and poor soil structure is understood to impact on floods and landslides. So too is the role of the built environment, such as tarmacking and pavements, recognised as a factor in flooding, and building housing on previously forested slopes recognised as causing landslides. → People understand there may be a trade-off between developing the built and preserving the natural environment and the need to find a balance between the two.

- Going into the countryside raises awareness of risks of floods and landslides

The role of impermeable surfaces, cutting down trees, and poor soil structure as increasing flood risk is recognised, as is the role of people in directly influencing flooding through leaving rubbish in the streets (blocking streams and drainage channels) and landslides through unregulated building on slopes.

Most do not see floods and landslides as a big threat – more an inconvenience – and see them as occurring in the same place and regularly – normalising the threat. However, there have been destructive landslides and these are often seen as self-inflicted, occurring due to land having been developed in an inappropriate manner. There is some doubt around how well or how long technical solutions will work and instead a feeling that there is the need to educate those that add to the risk (through dumping rubbish for example) and to regulate the area, including housing.

→ As awareness is the first step to 'taking-action' to mitigate the risk and improve response it is important to note that it is those that go into the countryside that are more likely to see flood, fire and landslide, as a threat, suggesting a raised consciousness of natural hazards through engagement with nature.

In summary, it is important to focus on environmental assets because they:

- o Bring gains in Human, Social and Financial capitals, and wellbeing more generally.
- o Are a site of inequality with women, the poor and the less educated having less access to them and the potential benefits they bring.
- o Are valued by people, as they like green spaces, plants and trees. While the poor access the countryside less they value urban green space more.
- o Can bring risks as well as enjoyment, and engagement with nature may help understanding of these risks and promote actions to mitigate them.

5. **How can we know the potential ES benefits of an area?**

Given the potential the natural environment provides for promoting stocks of human, social and financial capitals and promoting wellbeing, the first step in transforming this potential into real benefits is understanding what the potential ecosystem services are in any given neighbourhood.

Identifying / mapping ES in a local area is useful because it will:

- Help understanding around the link between the natural environment and its contribution to quality of life in a community or neighbourhood.
- Help identify and prioritise green areas that may be important to protect in any given community or neighbourhood.
- Develop or evidence an argument for protecting these green areas.
- Generate ideas for enhancing delivery of ES in the future, through input into to new urban developments, redevelopments and master plans.

The first step may be using existing resources to get a general idea of biophysical structures in the area or neighbourhood. Satellite images allow a general overview of land use at present, and depending on the quality, can also allow a first classification of the nature of the green, blue and grey/green spaces.

While land use data provide a general idea of the extent to which there are green areas or lakes, this does not tell us much about the potential for them to yield ES. A large expanse of green viewed from above may suggest extensive tree cover and the potential for regulating and supporting, provisioning and cultural services – but if underneath the canopy the trees are growing on the sides of a steep ravine then the latter two services, while potentially existing may not be mobilised due to the danger involved in accessing the trees. As such then it is important to complement the use of any existing maps and satellite images with ground level evaluation – or undertake a 'ground truthing' exercise.

Ground truthing seeks to establish the nature of the green and blue resources identified by the imagery and the extent to which they provide the potential to yield ecosystem goods and benefits or indeed dis-benefits. Walking through the area and recording the nature and extent of different habitats allows an assessment of potential. A simple table can be constructed of what natural capitals may be present, and using past experiences, the corresponding potential goods and services

recorded, with empty rows to note goods and services that had not been thought about prior to visiting the area. It becomes then a simple exercise to record the nature of the urban area (biophysical structures) and the potential for ES within the area, as illustrated by the table below.

However, recording what might be the potential ES within the area needs to be complemented by asking those that live in the area what they think and how they use the potential ES, in reality.

Table 1 - An Example of Mapping Capital Assets to Land Cover Types, Biophysical Structures and the linkages to delivering a range of Ecosystem Services

Capital Asset / Land-cover types	Example biophysical structures	Example provisioning services	Example regulating services						Example cultural services			
		Food	Water supply	Reduce temperature	Flood control	Purify water	Purify air	Store carbon	Aesthetics	Recreation	Tranquillity	Educational
Physical Capital - Main Roads	Street trees	Fruit		Yes	Yes		Yes	Yes	Yes		Yes	
	'Pocket' green space				Yes	Yes		Yes				
Physical Capital - Residential Areas	Enclosed gardens/ backyards	Fruit; vegetables		Yes	Yes	Yes		Yes	Yes	Yes	Yes	
	Plant pots	Fruit; vegetables							Yes			
	Hanging baskets	Fruit; vegetables							Yes			
Physical Capital - Commercial Retail	Plant pots								Yes			
	Hanging baskets								Yes			
Natural Capital - Blue Space - Water Bodies	Rivers	Fish; shellfish	Yes	Yes	Yes				Yes	Yes	Yes	Yes
	Streams	Fish; shellfish	Yes	Yes	Yes				Yes	Yes	Yes	Yes
	Reservoirs	Fish; game; shellfish	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes
	Wetlands	Fish; shellfish	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes
Natural Capital - Green Space – Vegetation	Open spaces unpaved									Yes		
	Squares			Yes	Yes		Yes		Yes	Yes	Yes	
	Open Park	Fruit, Veg		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
	Fields	Crops, Veg			Yes	Yes	Yes		Yes			
	Wood Vegetation	Fuel, Veg		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Native Forest	Fruit, Veg		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Riparian Vegetation		Yes		Yes				Yes			

6. How can we know what people think about the natural environment?

While an expert, scientific assessment tells us the potential for a local area or natural resource capital to yield ES unless these are mobilised and appropriated then it does not benefit the local community. Thus, it is important to monitor how local people understand and utilise the natural environment, how this differs by gender, age and other characteristics and how this may change over time.

Undertaking interviews with local residents, gives a good idea of what they think and questionnaires provide quantitative data to explore how opinions inter-relate, and while local community meetings and participatory consultation process also allow (some) voices to be heard and concerns expressed, such events are point in time acts rather than on-going activities. They provide a good snapshot of what is, but tells us nothing of what could be. Yet, environmental degradation and restoration occurs over time, and nature changes also with the seasons bringing benefits and dis-benefits as the climate changes. This raises the question of how to capture these changes? To continually return to an area to undertake studies or hold community meetings is both time consuming and expensive and participants would suffer from research fatigue.

6.1 An 'Urban App' for continuous environmental monitoring

One instrument used in this study not only allows a point in time assessment of environmental assets and their related eco-system services within a community, as perceived by the residents themselves, but also the potential to monitor these over time, and for them to highlight any aspects of concern and aspects that bring them positive benefits. To make sure residents would be happy to be involved in this over time monitoring, the instrument utilises everyday technology familiar to most – the modern 'smart' phone.

The 'Urban App' used in this study is a freely downloadable application for Apple and Android systems that has the capacity to record and send geo-referenced visual and textual data. Data is stored on a secure domain where it is visible in the form of either a list of participants and entries or a GIS map of entries.

This means that as residents walk around their neighbourhood and notice rubbish dumped in a stream, for example, they can quickly and easily record this through taking a picture, adding a caption, and uploading this to the secure site. Similarly,

the methodology encourages people to capture images of natural beauty such as a tree in full bloom, or resurgence of green spaces, not just degradation.

To date the Urban App has been used for research purposes, including lending a phone to a participant for a week if they do not have their own. However, it has proved most successful when used as part of a walking interview, led by a researcher. The photos and text entries were made by the participant and the narrative produced during the walk recorded and transcribed. The benefits of this methodology are that walking through the environment may lead to better discussions of the environment and what it means to participants as the changing landscape acts as visual prompts to what the participant sees to be important or not, useful or not, beautiful or not etc.

The main problem with using the App lies with the good internet connectivity needed to allow geo-referencing of the photos – weak or no signal limits the ability to utilise the methodology fully. Some people, especially older people, may not be used to smart phones and wary of using such expensive and modern technology. If loaned to them, use of the App could also help engage older people with modern technologies. Some may also be wary of taking photos in some locations or of some activities, for fear of how others might interpret this.

Findings generated by local people using the App have shown good overlap with the ES 'expert' assessments undertaken prior to the App's use. It has also provided richer detail and insights that the scientific assessment did not provide. It provided the researchers with a different perspective on the area, closer to that of the participants. Most importantly, walking with the purpose of presenting and analysing the environment for the researchers made participants aware of features they had overlooked during the 'sit down' interviews. One participant in the study, for instance, chose as a relevant feature a tree she used to climb and play in when she was a child. Another tagged as a negative feature a maximum-security prison near her house. Neither of these features had been mentioned in the interviews with them.

The added insights it brings give confidence in the App as a good means of data gathering and to provide a continued assessment of ES in a community. It would help to promote the active engagement of local people in protecting and promoting the environment in which they live, potentially providing a mechanism for collective

action contributing to social cohesion as well as providing a means for local authorities to easily (and cheaply) address any evolving environmental issues.

Developing a more nuanced understanding of which urban ES are generated and how they are used and valued by local people can inform a more developed understanding of the types of benefits accrued, as well as any associated dis-services. It can allow for future local level planning that responds to the needs of the local people and enhances both the natural environment and their wellbeing.

7. How can we help to enable more interaction with nature but also ensure actions to protect the environment?

This section of the Guidance uses the results from the study to make some suggestions around what might enable peoples' greater interaction with the environment. As Section Four highlights, there are many advantages to be gained through improving access to natural capital, including positive gains for human capital, for social capital and for financial capital. The study finds that people already do value green, blue and green/grey spaces and so enabling greater access would be something many would welcome and have positive wellbeing effects.

from the questionnaire survey only 21% of the people questioned rated green spaces in their top 3 key assets, this is relatively high given that out of necessity many would prioritise basic services as 'essential'. Some 52% of respondents rated green spaces as essential and 88% would be upset if there were less green spaces where they lived. This suggests the percentage that rate green spaces as a key asset could be made higher with a few changes. The use of local urban green spaces was more determined by the facilities – environmental and recreational – found there.   When talking to people, those who live closer to the countryside or reservoir were more likely to use these spaces for recreation and for provisioning.

→ If the public green spaces were more accessible through better public transport to them, or signage once there, they might be used more and valued more highly.

→ The provision of more green features and trees for shade in urban green spaces, as well as recreational services, such as gyms, would make them more attractive.

→ Safety is also a significant concern and people would be more likely to engage with and care for local green spaces if they felt more secure there.

→ Highlighting the benefits green spaces bring, through providing educational signs and materials, could help make people more aware that nature is an asset, and value it more as such.

→ Importantly it is men who recognise green spaces as a key asset so campaigns to raise awareness of the benefits of wider green spaces should be aimed at women.

Many people have a good understanding of the environment and the need to protect it due to its importance for providing Regulating Services particularly in relation to Climate Change.

→ The study suggests the importance of education – the higher the education level the more people expressed 'green' attitudes, so formal education within schools may be important for future sustainable use of environmental assets.

Many people feel angry at other people's actions that harm the environment such as cutting down trees or clearing land through burning, dropping or burning rubbish. They also feel there is little done to deter such behaviour through enforcing penalties, for example. People highlight how in parks and squares, a well maintained garden will deter people from dumping rubbish there, but a poorly maintained space with scrub and bushes that look untidy or 'dirty' may encourage dumping. This was echoed by those who visit the reservoir who see spaces that are not 'cared for' as 'dirty' and thus feel justified in leaving their rubbish. The lack of public toilets means there is further fouling of green and blue spaces, through necessity not choice.

→ The study highlights the desire for a governmental response, providing adequate public facilities in areas such as the reservoir, maintaining public green areas, or enforcing penalties on those that violate existing regulations.

While services such as rubbish collection and maintenance of open spaces do need to be improved, the dumping / burning of rubbish is often not because there is no collection service but because people don't bother with it/wait for it. If dumped rubbish is not cleared and there is no penalty for such actions, they will continue with them. However, there are areas of the study site where people feel that the authorities do not care for them, and accessing services such as public transport and rubbish collection is a constant struggle, making them less inclined or less able to act in ways that will protect the local environment.

→ Paying more attention to these areas of concern might well incentivise residents to take more responsibility for environmental quality as well, while improving environmental quality in parks and squares may deter dumping rubbish and other anti-social behaviour there.

Local squares and parks are valued, especially by the poor, and the young, childless and less educated, and those that do like parks value them highly, being likely to include them in their top three key community assets. The study suggests that local grey/green spaces are recognised as an asset and help create a sense of place and belonging, especially for the poor.

→ Improving access to local parks could go some way in overcoming the inequality in access to ES between those who have private green space and those that do not, and the differential access to the countryside.

→ The production of space and/or local land use planning at present, does not seem to pay much attention to developing urban green spaces, missing out on the provision of a range of benefits this can provide.

Respondents appear to value parks as a recreational and environmental asset, but planners need to get the right balance of recreational to environmental land use. The gyms are a good addition, for example, but not if there is no shade for those using it. Trees are nice, but nicer if you can sit on a bench in the cooling shade they provide. People understand the multiple benefits arising from plants and trees, including those which fall within the Provisioning, Cultural and Regulating services categories, and the potential they bring to strengthen Social Capital.

→ The findings suggest if trees and hardy plants were planted they would be valued and cared for by local residents, such collective action could aid social cohesion as well as bring the other wellbeing outcomes mentioned above.

Even small pockets of green or a few trees can make a difference to people and the planet, and have knock on benefits for other asset accumulation.

The lack of 'kerb side' trees was highlighted as a problem – the planting of which might also encourage people to walk more during the day due to the shade.

Trees and squares have been suggested as creating spaces for 'anti-social' behaviour, but in and of themselves they are not to blame for this and the negative effects of trees are less recognised by the respondents than the positives.

→ Recognition of the potential dis-services to be generated by trees and bushes can lead to identification of ways that such unwanted effects can be mitigated e.g. use of street lighting to avoid the generation of 'cover' for illicit activities.

→ Even small additions of 'green' in existing grey spaces, through planting on walls or around trees could bring the multiple wellbeing benefits documented in the study.

While people like the parks and squares, especially the poor, they also feel they lack recreational and environmental elements. Providing more play areas and planting more would encourage more visits and visitors, however it is security which is the real deterrent. Parks and squares are associated with gangs, violence and drug use. It is not clear what threat the drug users pose in reality to respondents, except perceptive dislike and an associated perception of danger. The fear is not necessarily of violence against the person themselves, but of being caught in cross-fire.

→ Fear of violence between others keeps people from accessing the existing green and grey/green spaces in their community and suggests the need for better policing.

Fear also keeps people from engaging with the countryside, a key predictor of walking in the countryside is feeling safe walking around the neighbourhood during the day. Those that do not feel safe walking in the neighbourhood, particularly

women, do not visit to the countryside. On the other hand, the feeling of wellbeing experienced by being in the countryside allows them to forget violence and enjoy peace and quiet, as noted when respondents do go there.

People also like to visit 'organised' spaces such as municipal parks or the gated communities.

→ Bringing order and security to the countryside – via more formalised and sign posted paths – may encourage visits as may holding organised walks.

→ Promoting 'eco-tourism' in the local area - providing public eco-facilities such as compostable toilets, encouraging organised and educational recreational activities, and incentivising local bars to take environmentally friendly actions to reduce pollution and degradation.

The study highlights that to foster engagement with green spaces – both urban and the countryside – may need an 'organised activity' approach such as an exercise class in a public square, a walking group around the barrio and the local countryside.

→ To encourage engagement with the countryside seems to need some level of organised activity to provide the access (more direct transport), create the order (set paths/routes to follow) and ensure security (going as a group with a 'lead') that seems to be important to people, especially women.

The reservoir is an environmental asset that has multiple uses – as it is a source of drinking water and a source of various recreational activities – which can be conflictive if not managed properly.

Some visitors from 'outside' are perceived to come to drink, to take drugs and to fight – they are then 'anti-social visitors' and leave evidence of their activities behind. Local people fear the potential for violence that comes with these visitors.

The others who come are 'leisure polluters' as they bring jet-skis, which disturb wildlife and those fishing, quad bikes, with noise, air and ground pollution, they have barbecues, which bring a potential fire risk, and leave their rubbish behind, including human faeces.

Fewer local people visit the reservoir area now as the opportunities for swimming there have lessened through drought and degradation – including through sewerage being released into the water.

Few like to walk through the forests, preferring to sit and enjoy the peace and quiet, which may be more difficult given the nature of the outsiders who visit.

→ Local people who use the reservoir do so for less intrusive recreational activities such as fishing and walking, than those that come from outside, and tend to take their rubbish home with them.

→ Local leisure use of the area is low intensity and non-intrusive. To protect this area the focus then needs to be on the visitors, not the residents – to target the 'anti-social visitors' and the 'leisure polluters'.

→ Women are those who most want to reservoir area controlled so any locally led action should engage women to be effective, which would have the added benefit of increasing their engagement with wider green and blue spaces, which is presently relatively low.

Swimming is less of an issue now due to low water levels, but it is clear that just explaining to people the reservoir is a source of drinking water is not enough to deter them, as those that swim there know this. Local people are aware that it is dangerous as there are hidden tree stumps and other hazards.

→ If swimming in the reservoir is a problem for the authorities (contamination) then as many who swim there know that the reservoir is for drinking water, better signage of the dangers (danger deep water/ death through drowning) may be an effective deterrent.

→ If targeting local residents, and /or visitors who swim is a priority, then campaigns should be aimed at men, as they swim most there.

→ Those who lack a 'private' green space such as a yard are the ones who are most likely to use this 'public' blue/green space, so there is a need not just to prohibit activities but to provide alternative leisure facilities.

→ If deterrent action is needed it is men that should be targeted, but as those who most want the area controlled are women, if local action is needed it is via women that initiatives should be developed.

People who report poor health in the family were also more likely to identify pollution as a problem, but also seemed unlikely to be bothered about there being less green space.

→ This suggests the need to educate people on the benefits to health of green spaces and how green spaces can help reduce pollution to encourage those that would benefit into taking actions which allow them to benefit.

Women have a heightened sense of local pollution as a problem, but they also engage less with wider green spaces.

→As those that report pollution are less likely to say they want to stay in the area, an indirect effect of any actions to improve air quality may be an increased association to place and sense of belonging.

→ Again, as it is women who most keenly feel that pollution is a problem it is they that the issue should be discussed with and from whom possible solutions may arise.

8. How to ensure gender equality of access to ES and associated wellbeing gains

When thinking about gender within a capital assets framework we need to think about the characteristics that define the women of the community being studied/target area, and what 'being a woman' is associated with. From the study women are:

- More likely to be poor
- More likely to be responsible for housework

- Less likely to feel able to ask neighbours or friends for help
- More likely to be distant or conflictive with neighbours
- Less likely to think it is safe to walk around their local area in the day and during the night
- More likely to be evangelical

- Less likely to have a tree in their home
- Less likely to walk in the countryside
- Less likely to visit the reservoir

- Less likely to know the service the reservoir provides
- Less likely to think it is OK to swim in the reservoir
- More likely to want public access to the reservoir controlled

- More likely to report pollution is a problem

- Less likely to aspire to live in a more rural area
- Less likely to attach importance to green areas, woods and blue spaces

The study demonstrates that there is a gender inequality in accessing and benefiting from Natural Capital and that women have intersecting inequalities related to lower levels of intersecting capitals assets.

Women have lower levels of Financial Capital (being income and time poor), lower levels of Social Capital (less able to ask for help, feel more afraid) and lower levels of Natural Capital (less access to trees, green and blue spaces) – and women's lower levels of access to capital assets is often reinforcing, as access to Natural Capital is being limited through lack of income, time, and fear of the local neighbourhood spaces and beyond.

Women are also less likely than men to express 'green attitudes' (seeing green and blue spaces as an important asset) and this somewhat contradicts the existing notions of women being closer to nature.

The qualitative interviews highlight that women and men have a different relationship with nature. When seen as a site for Provisioning Services, the countryside is a masculinised space as it is men that are more likely to say they go fishing and hunting. As a site for leisure and Cultural Services, it is those with higher incomes and higher education that are more likely to visit for recreational use, and again given women in general have lower levels of both income and education, this may help explain their limited engagement.

Women also tend to be more 'time poor' – with many engaged in income generating or productive activities as well as taking responsibility for reproductive activities, or housework within the home. If visiting the countryside demands a long and arduous trip on bad roads by public transport, women may be less inclined, and have less time to visit. Time may also limit their ability to visit local green spaces.

However, feeling afraid to walk alone around their neighbourhood even during the day, emerged from the survey as the key factor limiting access to all public green spaces – including the countryside, the reservoir and urban green space.

Many in the interviews talked about green areas that were not 'maintained' as 'dirty', favoured more formalised urban parks, admired country houses, and saw nearby gated communities with manicured lawns as being beautiful spaces. As such the countryside was often seen as something that needs to be tamed or given order.

To encourage engagement with the countryside may need some form of organised activity to provide the access (more direct transport), create the order (set paths/routes to follow) and ensure security (going as a group with a 'lead') that seems to be important to people, especially women.

The feeling of insecurity around public green spaces ultimately, however, stems from how safe people do/do not feel in their daily lives. Making the local urban context feel more secure – through policing and maintaining urban public green spaces – may not only increase engagement of women with these spaces but also the wider countryside.

It is important to increase women's access to green and blue spaces not only for the potential wellbeing improvements this may bring for them, but also for the environment. The study demonstrates, women are more likely to want the reservoir

area controlled, and this is related to wanting cleaning improvements in the local area also. Women's engagement with public green and blue spaces may be important for maintaining and protecting these areas.

The evidence finds women to be very sensitive to pollution problems, and are more likely to report these issues. Woman should be spoken to about what the existing pollution problems are perceived to be and should be central to any campaigns or local actions to address these issues.

Although this Guidance Note highlights the need to work with women to promote local action to protect and improve the environment, it is important to note that the women in the study, as is the case for women the world over, are not only more likely to be income poor, but more likely to be time poor. As any actions that target women will add to their already heavy workload then actions must bring some direct benefit to women also, if they are not merely to use women to achieve wider wellbeing aims.

The wider policy literature highlights also that just involving women in actions to improve or maintain, for example, the reservoir and surround, will not necessarily improve their ability to enjoy the benefits of the reservoir – for this actions that directly target equality of access to and benefits from, natural capital are also needed (see above).

As access to Natural Capital interacts with other capitals it also suggests gender equality programmes need to consider the environment as an important factor in determining women's wellbeing.

Access to green and blue spaces is limited by poverty, education and gender, so local NGOs might think about incorporating environmental issues into their work, given that access to these spaces improves people's wellbeing. Access is also related to concerns around violence and drugs, but maintaining and improving green spaces may lessen anti-social behaviour in them and improve access. As women have lower levels of access to green and blue spaces, higher feelings of insecurity, and lower levels of social capital then, environmental recreational programmes for women, such as guided walks, may help address these gendered inequalities and improve women's wellbeing.